# United States Patent [19]

**Rowley**

[11] **3,970,000**

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[54] **LABEL STOCK OVERPRINTING MACHINE**


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[73] Assignee: **Berisfords Limited,** Congleton, England



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[51] **Int. Cl.²** ..... **B41F 5/06;** B41F 5/16

[58] **Field of Search** ..... 101/178, 181, 184, 233, 101/234, 235, 245



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[57] **ABSTRACT**

For printing continuous woven label stock (i.e. a web consisting of a plurality of woven labels connected together end-to-end) a printing machine comprises a support which supports the label stock and progresses it past a printing station having a printing head including a printing roller adapted to be rotated in synchronism with the moving stock sufficiently for a single printing operation upon passage of each label, driving of the printing head being initiated by a sensor which senses a datum mark on each label. For printing a plurality of colors, there may be a number of such printing heads, driving of each successive one of such printing heads being initiated by rotation of the preceding printing head.


**7 Claims, 4 Drawing Figures**

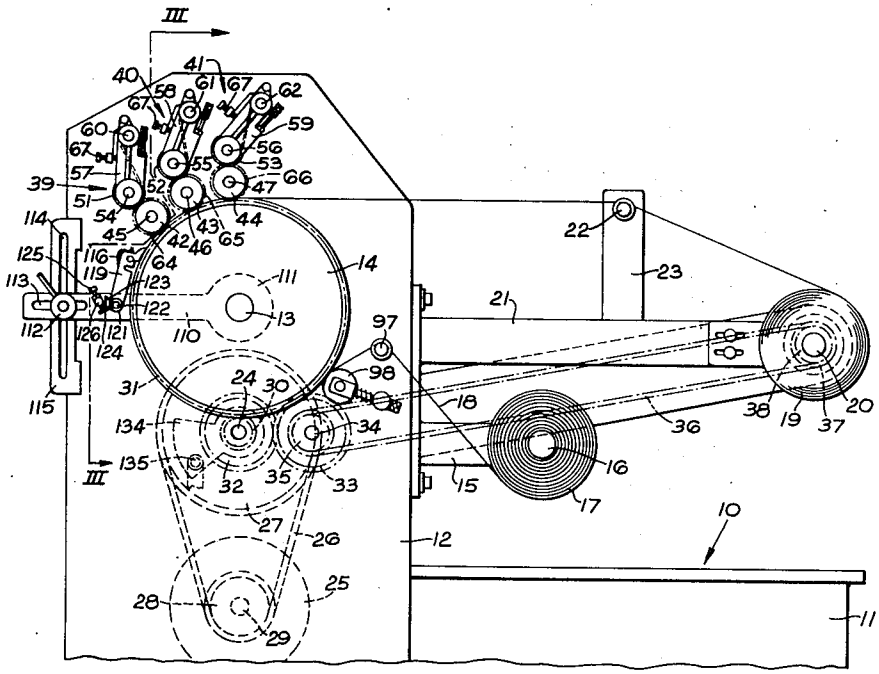
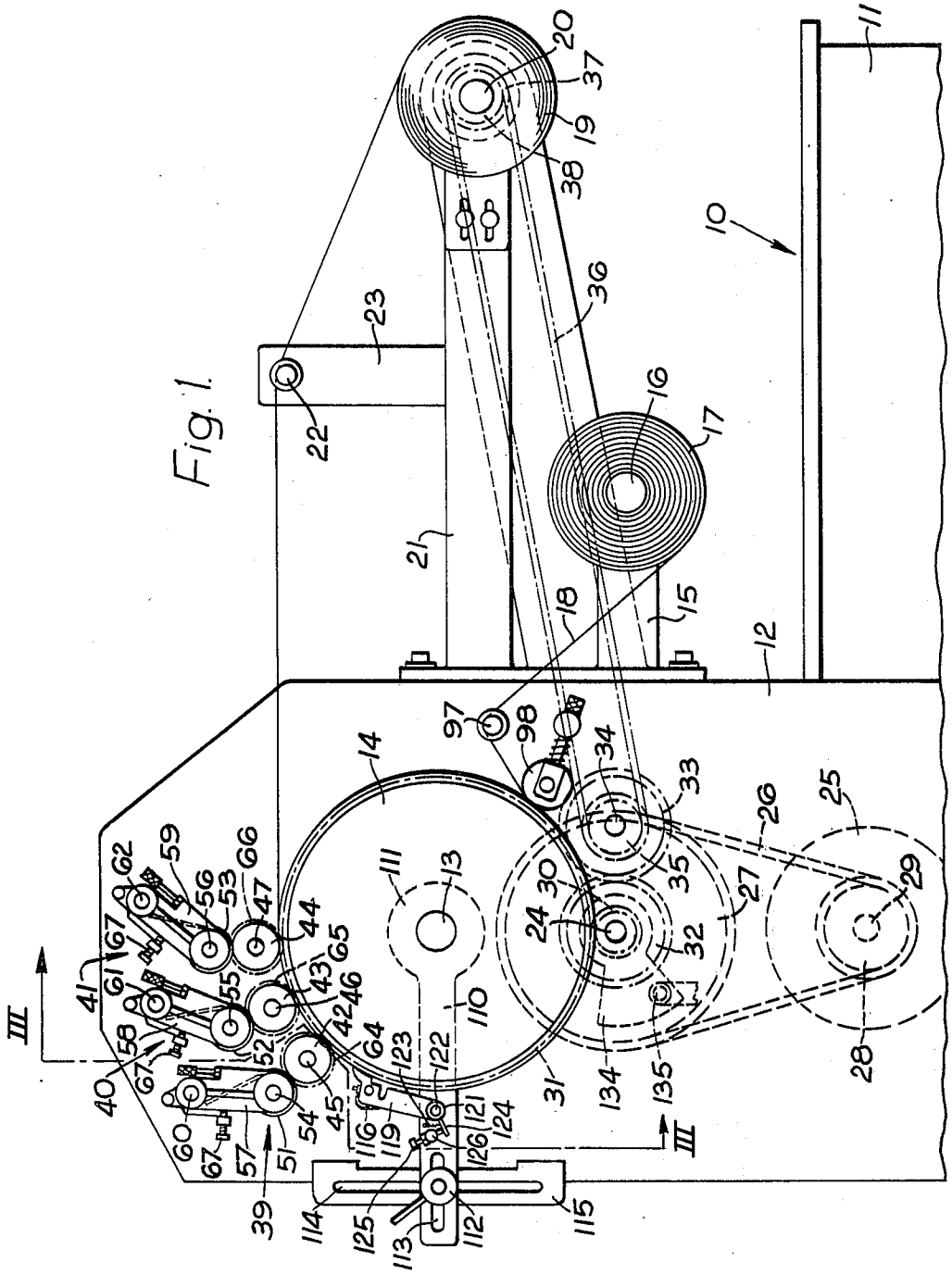


Fig. 1.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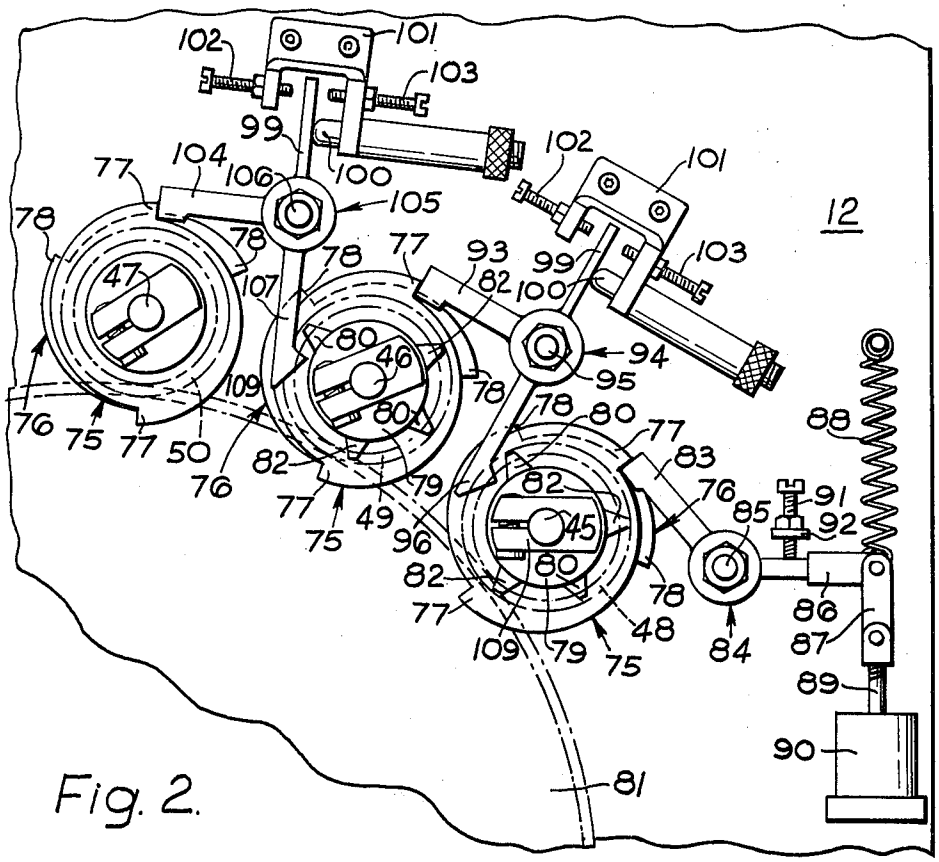
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Fig. 2.

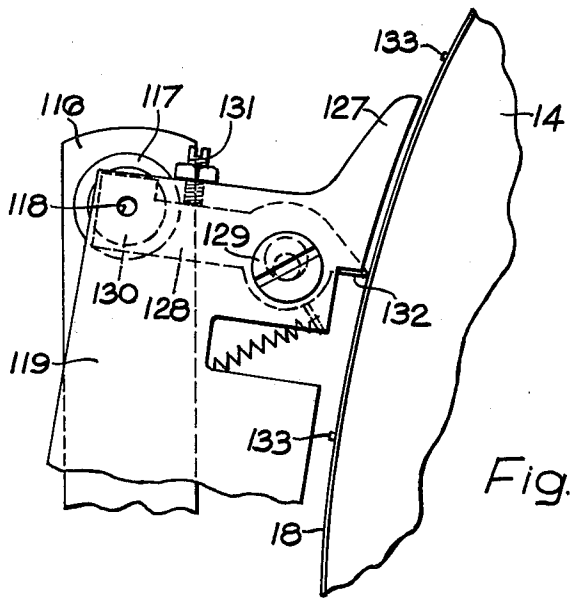
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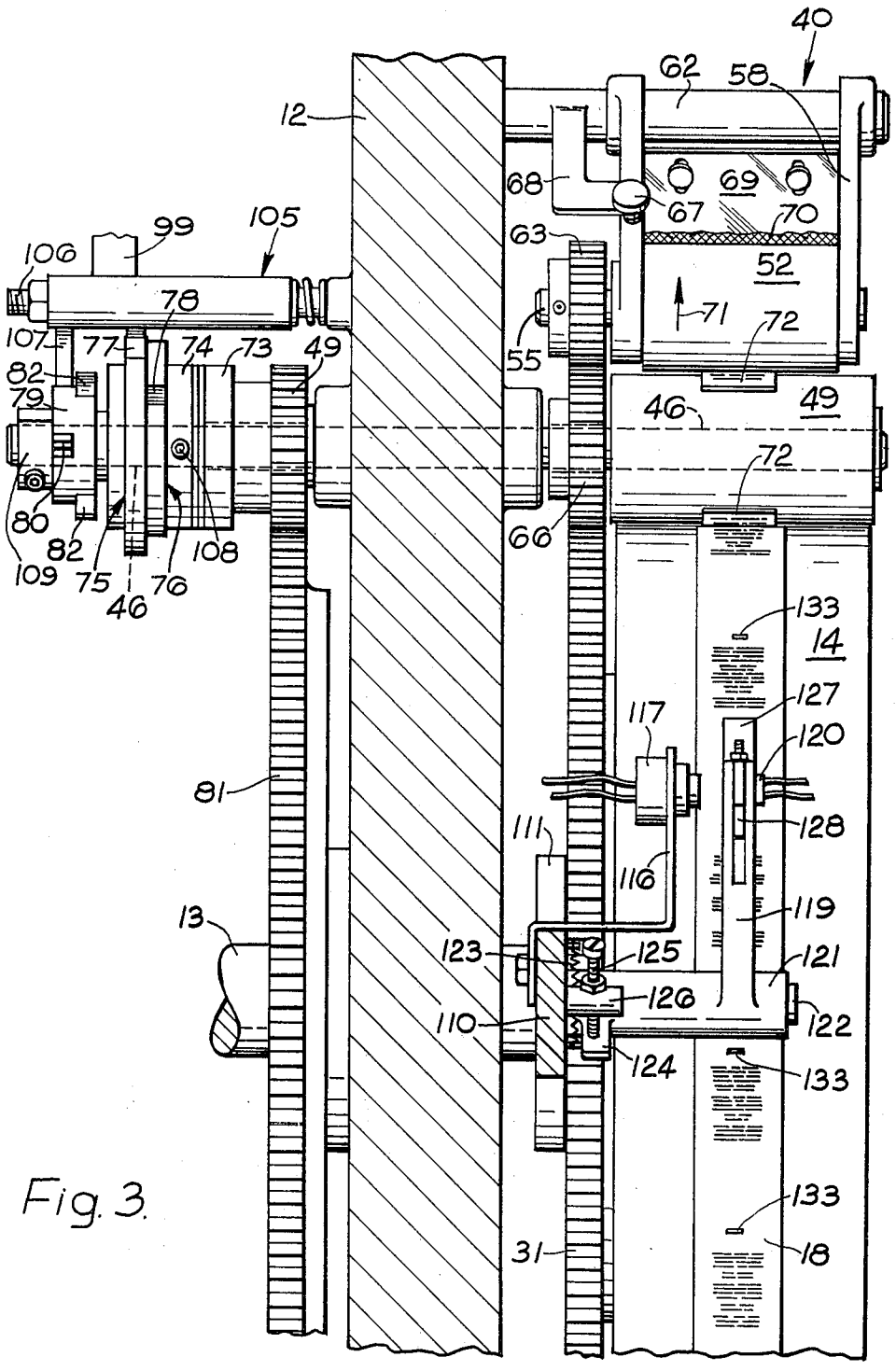
Fig. 4.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119
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121
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Fig. 3.

# LABEL STOCK OVERPRINTING MACHINE

This invention concerns a machine for overprinting continuous woven label stock, that is to say a continuous woven web consisting of a plurality of woven labels connected together end-to-end.

Existing methods of overprinting such continuous woven label stock are generally capable only of printing the web with a single colour and involve progressing the web stepwise, bringing it to a stop for each successive printing operation. Because the web has to be arrested between successive printing operations, the known methods are of relativley low productive capacity, for example of the order of 100 labels per minute.

In practice, it is often required to be able to overprint data (e.g. variable data such as size, washing instructions and so on) in various different colours upon woven labels in continuous woven label stock, but such overprinting involves substantial difficulties arising from the fact that the labels in continuous label stock vary considerably in length from label to label, these difficulties having hitherto been considered to be almost insurmountable where overprinting in two or more different colours is concerned.

An object of the present invention is to provide a machine which enables the labels in woven label stock to be overprinted at a considerably faster rate than has hitherto been possible, and also can be constructed so as to enable accurate multi-coloured overprinting to be effected upon label stock at a rapid production rate in a relatively simple and effective manner.

With this object in view the present invention provides a machine for overprinting continuous woven label stock comprising a support for supporting the label stock and progressing it past a printing station whereat is a printing head comprising a printing roller carrying an impression of data to be printed and an inking arrangement, said printing roller being adapted to be driven sufficiently for a single printing operation upon the passage of each label through the printing station, driving of said printing roller being initiated by sensor means for sensing a datum mark on each label.

For enabling the woven label stock to be printed with a plurality of colours the printing station preferably comprises a plurality of said printing heads, one for each colour to be printed, each said printing head comprising a respective said printing roller carrying a respective impression of the respective data to be printed and a respective inking arrangement, said printing roller being adapted to be driven successively and sufficiently for respective single printing operations upon the passage of each label through the printing station, driving of the first of the printing rollers being initated by said sensor means which serves to sense the datum mark on each label, and the driving of each succeeding printing roller being initiated from the rotation of the preceding printing roller.

Preferably each printing roller comprises a respective continuously-driven element adapted to drive its respective printing roller by way of a respective clutch including a ratchet toothed disc which rotates with its printing roller and a respective pawl which co-operates with the toothed wheel and disengages therefrom to permit rotation of the printing roller for each successive single printing operation.

In such an arrangement, the pawl of the first printing roller will, of course, be adapted to be disengaged from its toothed disc by the sensor means; the pawls of the succeeding printing rollers may conveniently be adapted to be disengaged from their respective discs by respective cam lobes on the disc of the preceding printing roller.



The support for supporting the label stock may conveniently comprise a resiliently-tired roller of diameter substantially greater than the diameters of the printing rollers.

In order that the invention may be fully understood, it will be described further, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is a fragmentary front view of a preferred embodiment of the machine of the invention;

FIG. 2 is an enlarged fragmentary rear view illustrating part of the machine of FIG. 1;

FIG. 3 is an enlarged fragmentary part-sectional end view taken approximately as indicated by line III—III of FIG. 1 showing the details of one of the printing heads of the machine and its respective drive mechanism;

FIG. 4 is an enlarged fragmentary detail of part of FIG. 1.

The illustrated preferred embodiment of the machine conforming to the invention is for three-colour overprinting of labels in continuous woven label stock and comprises a machine frame, indicated generally by the numeral **10**, providing a bottom housing **11** above which is a substantially vertical mounting plate **12** through which extends a horizontal shaft **13** which carries a large-diameter resiliently-tired support roller **14**. Journalled in a lower horizontal mounting arm **15** bolted to the plate **12** so as to be spaced horizontally from the roller **14** is a feed-off spindle **16** for carrying a reel **17** of continuous woven label stock from which a web **18** of woven labels progresses by way of a guide roller **97** and a pressure roller **98** to meet the support roller **14** near to its lowest point, whereupon it passes firstly downwards and then upwards around the support roller **14** and then approximately horizontally to an idler roller **22** after which it passes to a take-up reel **19** on a take-up spindle **20** journalled in an upper horizontal mounting arm **21** disposed above the arm **15**, the intermediate idler roller **22** being mounted on a bracket **23**, secured to the arm **21**.

A main drive shaft **24** is journalled in the mounting plate **12** and this is driven from an electric motor **25** (FIG. 1) within the bottom housing **11** of the machine by a drive belt or chain **26** extending around a pulley or chain wheel **27** on the shaft **24** and a sprocket **28** on shaft **29** of the motor **25**. A gear **30** on the main drive shaft **24** meshes with a first large diameter gear **31** which is secured to the tired support roller **14** to provide for the latter to be rotated from the electric motor **25**. A further gear **32** on the main drive shaft **24** meshes with a gear **33** on a shaft **34** journalled in the mounting plate **12** and having a sprocket **35** secured thereon.

A chain **36** extends around the sprocket **35** and around a sprocket **37** mounted by way of a friction clutch **38** upon the take-up spindle **20**. This arrangement provides, of course, for the take-up reel **19** to be driven from the electric motor **25** so as to wind up the web **18** at the same speed as it passes around the support roller **14**.

Three printing heads **39, 40** and **41** are mounted on the mounting plate **12** at closely-spaced intervals around an upper part of the support roller **14** as can be seen from FIG. 1. Each such printing head comprises a respective printing roller **42, 43, 44** mounted upon a

respective printing roller shafts **45, 46, 47** journalled in and projecting to the other side of the mounting plate **12** and carrying a respective gear **48, 49, 50** which is mounted so as to be rotatable relative to the respective shaft **45, 46, 47** and which meshes with a second large diameter gear **81** secured to the shaft **13** so that the three gears **48, 49, 50** are rotated continuously from the electric motor **25.** Associated with each printing roller **42, 43, 44** is a respective inking arrangement comprising a respective inking roller **51, 52, 53** mounted on a respective spindle **54, 55, 56** journalled in a respective pair of links **57, 58, 59** swingably mounted upon a respective post **60, 61, 62** projecting from the mounting plate **12.** Each of the inking rollers **51, 52, 53** has a respective gear (of which only gear **63** is visible in FIG. **3** of the drawings) meshing with a respective gear **64, 65, 66** freely rotatably located on the printing roller shafts **45, 46, 47** of the respective printing rollers **42, 43, 44** and meshing with the first large diameter gear **31.** A respective knurled screw **67,** through a respective angled bracket **68** formed integrally with the respective post **60, 61, 62,** abuts a corresponding one of the respective links **57, 58, 59** to load the inking rollers **51, 52, 53** towards engagement with the respective printing rollers **42, 43, 44.**

Each of the pairs of links **57, 58, 59** locates therebetween a respective ink blade **69** (FIG. **3**), a small mass of ink **70** lying in the angle between the blade **69** and the respective inking roller **51, 52, 53** so as to apply a uniform ink coating on the outer curved surface of the inking roller **51, 52, 53** as the latter rotates in the direction indicated by the arrow **71** (FIG. **3**) for applying ink, by transfer, to electrotypes or cliches **72** carried by each of the printing rollers **42, 43, 44.**

Each printing roller **42, 43, 44** is mounted, with its axis substantially horizontal, so as to be spaced away from the periphery of the support roller **14** by a very small distance approximately equal to or slightly less than the thickness of stereotypes **72,** which are of rubber or metal and are carried by each printing roller **42, 43, 44** at two diametrically-opposed positions. These stereotypes **72** constitute, of course, impressions of respective data to be printed by the printing rollers **42, 43, 44,** and it is to be understood that each printing roller **42, 43, 44** may be replaced by respective rollers each carrying three respective cliches or electrotypes **72.**

As already described, each printing roller **42, 43, 44** is fixedly mounted upon one end of the respective printing roller shaft **45, 46, 47** which is journalled in the mounting plate **12,** the shafts **45, 46, 47** of the three printing rollers **42, 43, 44** each being equispaced from the axis of the support roller **14.** The second large diameter gear **81** constitutes a printing roller main drive gear and is mounted upon the shaft **13** at the rear of the vertical mounting plate **12,** remote from the support roller **14.** This printing roller main drive gear **81** is in constant mesh with the printing roller gears **48, 49, 50** of which a respective one is rotatably mounted upon each of the printing roller shafts **45, 46, 47.**

As can be seen from FIG. **3,** each such printing roller gear **48, 49, 50** is connected to a respective rotatable first clutch disc **73** forming one half of a respective friction clutch, of which the other half is constituted by a second clutch disc **74** secured to or integral with a respective pair of toothed discs **75, 76,** which second clutch disc **74** is fixed on the respective printing roller shaft **45, 46, 47.** The toothed disc **75** has two diametrically opposed ratchet teeth **77** on its periphery and the toothed disc **26** has three equispaced ratchet teeth **78** around its periphery. The rotatable clutch disc **73** and the corresponding second clutch disc **74** are in frictional engagement with one another so that in the absence of any restraint upon the second clutch disc **74** rotation of the printing roller gear **81** results in the second clutch disc **73,** the printing roller shafts **45, 46, 47** and the printing rollers **42, 43, 44** all being correspondingly rotated.

The printing shafts **45, 46** of the first and second printing rollers **42, 43** (i.e. the printing rollers first and second encountered by the label stock web **18** as it is progressed around the support roller **14**) each have secured thereto a respective cam disc **79,** these each having a pair of diamertically-opposed cam lobes **80,** and, axially displaced relative thereto by the same distance as the teeth **77** are spaced from the teeth **78** axially, three equispaced lobes **82.**

A respective pawl for engagement with the one or the other of the toothed disc **75, 76** of the first printing roller **42** is provided by one arm **83** of a first bell crank lever **84** mounted by a pivot **85** on the mounting plate **12,** the other arm **86** being connected by a link **87,** loaded by a spring **88,** to the armature **89** of a solenoid **90,** so that energisation of the solenoid **90** disengages the pawl **83** from the toothed disc **75** or **76** to permit the first printing roller **42** to rotate. A stop, into engagement with which the spring **88** loads the arm **86,** is provided by a screw **91** through a tongue **92** carried by the mounting plate **12,** and the bell crank lever **84** is shiftable axially on the pivot **85** to provide for the pawl **83** to be selectively engaged with the one or the other of the toothed discs **75, 76.**

A respective pawl for the toothed discs **75, 76** of the second printing roller **43** is provided by one arm **93** of a second bell crank lever **94** mounted by pivot **95** on the mounting plate **12,** the other arm **96** constituting a cam follower disposed to co-operate with one or the other of sets of lobes on the cam disc **79** on the first printing roller shaft **45,** so that upon rotation of the first printing roller shaft **45,** the lobes on the cam disc **79** thereon serve to pivot the second bell crank lever **94** to disengage the second pawl **93** from the second toothed disc **75** or **76** to permit the second printing roller **43** to rotate.

A radial tongue **99** formed integrally with the bell crank lever **94** is loaded by a spring-loaded plunger **100** to ensure that the pawl **93** and cam follower **96** are loaded towards respective positions in the paths respectively of the ratchet teeth **77** or **78** and the lobes **80** or **82.** The plunger **100** is mounted in a bracket **101** secured to the mounting plate **12** and opposed set screws **102** and **103** in the bracket **101** serve to limit the possible pivotal movement of the bell crank lever **94.**

Similarly a respective pawl for the toothed discs **75, 76** of the third printing roller **44** is provided by one arm of **104** of a third bell crank lever **105** mounted by pivot **106** on the mounting plate **12,** the other arm **107** thereof being a cam follower disposed to co-operate with the cam disc **79** on the second printing roller shaft **46,** so that upon rotation of the second printing roller shaft **46,** the cam disc **79** thereon pivots the third bell crank lever **105** to disengage the third pawl **104** from the third toothed discs **75, 76** to permit the third printing roller **44** to rotate.

The third bell crank lever **105** has its respective radial tongue **99**, plunger **100**, bracket **101** and set screws **102, 103.**

It will be understood that the bell crank levers **94** and **105** are shiftable axially on their respective pivots **95** and **106** in exactly the same way as the bell crank lever **84** is shiftable so that in the one position of such bell crank levers **84, 94** and **105** the pawls **83, 93** and **104** co-operate with the toothed discs **76** each having three ratchet teeth **78** thereon and the cam followers **96** and **107** each co-operate with the three lobes **82** on the respective cam discs **79.** This position of the bell crank levers **84, 94** and **105** is employed when use is made of printing rollers **42, 43** and **44,** each having three electrotypes **72** thereon. In the illustrated case, where the printing rollers **42, 43** and **44,** the bell crank levers **84, 94** and **105** are shifted to their other position which is as shown in the drawings wherein the pawls **83, 93** and **94** co-operate with the toothed discs **75** each having two ratchet teeth thereon and the cam followers **96** and **107** each co-operate with the two lobes **80** on the respective cam discs **79.**

The relative orientations of the printing rollers **42, 43** and **44** and the respective second clutch discs **74** together with their toothed disc **75, 76** are adjustable by adjustment of the orientation of the second clutch discs **74** on their respective printing roller shafts **45, 46, 47** by means of respective clamping screws **108.** Similarly, the orientations of the two cam discs **79** and the respective toothed discs **75, 76** on the two printing roller shafts **45** and **46** are adjustable by means of respective pinch clamps **109.**

A radial arm **110** is mounted by a boss **111** on one end thereof so as to be swingable about the axis provided by the horizontal shaft **13.** A clamping bolt **112** through a slot **113** adjacent the other end thereof extends also through a slot **114** in a clamp plate **115** secured to the mounting plate **12** and thereby provides for the arm **110** to be clamped in a desired angular position relative to the support roller **14.** The radial arm **110** carries a Z-bracket **116** at the upper end of which is a photoelectric cell **117** which is aligned with a aperture **118** through a sensor lever **119** adjacent its outer end in register with a light source **120** (FIG. **3**) carried by said lever **119.** The lever **119** is pivotally mounted, by a boss **121,** on a pivot pin **122** carried by the radial arm **110** and is loaded, by a spring **123** connected to a radial tongue **124** integral with the boss **121,** in a clockwise direction as viewed in FIG. **1,** to the illustrated rest position wherein the radial tongue **124** abuts an adjusting screw **125** through a peg **126** fixed to the radial arm **110** and wherein a shoe **127** at the upper end of the lever **119** is spaced slightly from the confronting surface of the support roller **14.** Obviously, the spacing of the shoe **127** from the roller **114** can be adjusted by the screws **125.**

The upper end of the sensor lever **119** is bifurcated or slotted to accommodate a shutter element **128** which is pivotally located in place by an eccentric screw **129** and includes a tail portion **130** which, in the illustrated position of the element **128** as defined by abutment thereof against an adjusting screw **131,** registers with the aperture **118** and prevents impingement of light from the source **120** on the photoelectric cell **117.** The shutter element **128** is so weighted that it assumes the illustrated position under the influence of gravity and that a light anti-clockwise (as viewed in FIG. **4**) force, applied to a tip portion **132** thereof protruding at the shoe **127,** will pivot such element **128** to move the tail portion **130** out of register with the aperture **118** thereby to cause the photoelectric cell to be energised by the light from the source **120.**

As is well known, in continuous woven label stock it is quite usual to include, at the termination of each label, a thickened woven-in bar **133** of a plurality can be seen in FIGS. **3** and **4.** The tip portion **132** of the shutter element **128** is disposed so as to register with the path of movement of these bars **133** so as to be deflected by momentarily being pivoted upwards against the weight of the element **128,** upon the passage of each successive bar **133,** thereby to energise the photoelectric cell **117** which in turn serves to energise the solenoid **90.**

The operation of the machine will readily be understood from the foregoing description. The support roller **14** operates, of course, to progess the label stock continuously through the printing station constituted by the three printing heads **39, 40** and **41** and each time an individual label to be printed approaches such station one of the woven-in bars **133** (conveniently the woven-in bar **133** of the next succeeding label) in the stock engages with the tip **132** of the shutter element **128** to cause momentary energisation of the solenoid **90.** This causes the first pawl **83** to be disengaged momentarily from the periphery of the toothed disc **75** of the first printing roller **42** to disengage from one tooth **77** thereof and then to be re-engaged with the periphery of such toothed disc **75** to engage in due course with the other tooth **77** thereof. As a result, the first printing roller **42** is permitted to perform one half of a revolution and produce its respective impression on the label to be printed.

Such rotation of the first printing roller **42** is accompanied by rotation of the first cam disc **79** and one of the lobes **80** thereof acts upon the arm **96** of the second bell crank lever **94** to displace the latter momentarily against the loading of its plunger **100,** thereby to disengage the second pawl **93** momentarily from the periphery of the toothed disc **75** of the second printing roller **43** to disengage from one tooth **77** thereof and then to re-engage it with the periphery of such toothed disc **75** to engage in due course with the other tooth **77** thereof. As a result, the second printing roller **43** is permitted to perform one half of a revolution and produce its respective impression on the label being printed, the register having been adjusted by adjustment of the orientations of the clutch discs and cam discs on their respective shafts as already mentioned.

In a precisely similar manner, the rotation of the second printing roller **43** and its second cam disc **79** causes disengagement of the third pawl **104** momentarily from the periphery of the third toothed disc **75** to permit rotation of the third printing roller **44** to produce its respective impression.

The cumulative effect of the rotation of the three printing rollers is, therefore, to produce three successive impressions in their respective colours, in respective desired locations or dispositions on each of the successive labels in the label stock web **18,** the web **18,** after printing, being wound up at the take-up reel **19.**

In practice, the machine as described can be run at very high speeds, for example up to about 400 labels per minute, and will produce accurately registered impressions upon the successive labels in the stock, regardless of differences (which are not avoidable) in the lengths of the successive woven labels.

The invention is not confined to the precise details of the foregoing example and variations may be made different Thus, it will readily be understood that it is not essential that the machine should be capable of printing differnt coloured impressions and it will generally be constructed to print one, two or three colours, although a larger number of printing heads would be possible, the maximum number of colours being determined by the available space for accommodating the corresponding printing heads. Naturally, different mechanisms for initiating operation of the first printing roller and the successive operations of the succeeding printing rollers can be employed from those described (and of course no such mechanism will be necessary where single colour overprinting is involved) and different arrangement can be employed for progressing the woven label stock through the printing station.

It is, of course, possible to vary the number of stereotypes provided on the printing rollers, in which case it is necessary to provide for the toothed wheels and cam discs to have as many lobes as there are stereotypes on the respective printing roller, so that rotation of each printing roller sufficient to perform a respective single printing operation is sufficient to initiate appropriate rotation of the next printing roller. In the illustrated case there are two stereotypes on each printing roller and the arrangement is such that printing rollers each having three stereotypes can be substituted, but of course this can be varied.

It will be observed from FIG. **1** that in the case of the illustrated machine, a shutter **134** is provided on the main drive shaft **24** and this co-operates with a secondary photoelectric device **135.** This arrangement, which is optional, enables the machine to be set up in the first instance without needing to make use of woven label stock which probably would be spoilt in the initial stages. Setting up is therefore effected, initially, using a relatively cheap paper tape in the place of the label stock, and with the photoelectric device **135** switched on in the place of the photoelectric cell **117,** so that the printing heads **39, 40, 41** are actuated to produce their respective impressions on the paper tape each time the shutter **134** operates the photoelectric device **135.** Inspection of such impressions enables appropriate adjustments to be effected, at each printing head, of the toothed discs **75, 76** and cam device **79** to obtain appropriate registrations, relative to one another, of such impressions on the paper only then is the woven label stock threaded in for overprinting.

It will be understood, of course, that with the shutter **134** and photoelectric arrangement **135** available on the machine, the latter can, if desired, be used for printing continuous strip material at regular intervals but without registration, so the strip material would have to be plain.

I claim:

**1.** A machine for overprinting continuous woven label stock comprising:

a printing station,

a support for supporting the woven label stock and progressing it past the printing station,

the printing station including a printing head consisting of a printing roller carrying an impression of data to be printed and an inking arrangement,

a drive means for the printing roller sufficiently for a single printing operation upon the passage of each label of the woven label stock through the printing station,

a sensor means for initiating the driving of the printing roller through the sensing of a datum mark on each label of the woven label stock,

a separate printing head for each color to be printed,

each printing head including a respective printing roller carrying a respective impression of the respective data to be printed and a respective inking arrangement,

the printing rollers being driven successively and sufficiently for respective single printing operations upon te passage of each label through the printing station,

the driving of the first of the printing rollers being initiated by the sensor means serving to sense the datum mark on each label,

and the driving of each succeeding printing roller being initiated from the rotation of the preceding printing roller.

**2.** A machine as claimed in claim **1,** wherein each printing roller comprises a respective continuously-driven element adapted to drive its respective printing roller by way of a respective clutch including a ratchet toothed disc which rotates with its printing roller and a respective pawl which cooperates with te toothed wheel and disengages therefrom to permit rotation of the printing roller for each successive single printing operation.

**3.** A machine as claimed in claim **2,** wherein the pawl of the first printing roller is adapted to be disengaged from its toothed disc by the sensor means.

**4.** A machine as claimed in claim **3,** wherein the pawls of the succeeding printing rollers are adapted to be disengaged from their respective disc by respective cam lobes on the disc of the preceding printing roller.

**5.** A machine as claimed in claim **1,** wherein the support for supporting the label stock comprises a resilient roller of diameter substantially greater than the diameters of the printing rollers.

**6.** A machine as claimed in claim **1,** wherein the sensor means comprises a photoelectric sensor adapted to energize a solenoid to initiate driving of the printing rollers.

**7.** A machine as claimed in claim **6** including a secondary photoelectric cell arrangement adapted to be rendered operative in the place of the photoelectric sensor and to initiate driving of the printing rollers upon each rotation of a driven member of the machine.

* * * * *